# The American

# GAS-LIGHT JOURNAL.

(ILLUSTRATED.)

DEVOTED TO THE INTERESTS OF

## ILLUMINATION, HEATING, VENTILATION

AND

## GENERAL SCIENCE.

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ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.


## BRIEFLY TOLD.

THE SITUATION IN BROOKLYN.—The financial situation respecting the Brooklyn gas companies is, to say the least, odd; and it would be amusing were it not for the vast amount of money concerned, and the very large number of holders of the shares, whose very incomes, in some instances, are being bandied about by the bigger speculators, that are directly touched in the curious struggle for control now going on. That there is pressing need for some sort of reorganization is brought out from the restless uncertainty that encompasses the situation; but that there is any likelihood of an immediate or even near solution of the problem we very much doubt. Financiers of doubtful quality and of uncertain grade are reported to be tumbling over one another in their efforts to get in the last and highest bid for control in this, that and the other Company, and yet the control in any is not, nor has been absolutely secured, which remark even likely applies to the Brooklyn Company, in that Mr. Addicks is believed not to have been able to obtain outright an actual majority of the shares, although it is just as likely that what he does own is fortified by binding pledges given by others, that together put him to all intents and purposes in the premiership of the Brooklyn Company. We must say that it looks to us he did not make any mistake in his first venture over in Brooklyn in respect of the partial purchase of Brooklyn's initial Company; for it is undoubtedly the best situated—even better than is the Nassau or the Williamsburgh—from its natural position to manufacture and distribute gas economically. Nor did he pay too high a price for it, either, the value of its real estate being taken into consideration, not to mention anything about the readiness and safety with which it could respond to further capitalization—either in the shape of bonds or stock. It would be worth twice, for his proposed ultimate intention, than, for instance, either the Fulton-Municipal, or the Citizens, or three times the price at which the Metropolitan Company would be at the quoted bid rates for their stock, provided that he could secure the right under his Brooklyn charter to go to any part of the city with mains for the supply of gas. While not knowing that such is the case, we presume that when the old Brooklyn Company, in the heyday of its prosperity, sold off "for cash and other considerations" large sections of its territory to the Citizens, Metropolitan, Nassau and other Companies, it also agreed and covenanted with such offspring that it would never invade the respective territories so assigned, and if this is true, then the charter right is rather restricted. Yet, as Mr. Addicks is an adept at influencing legislation—that is, in directing it so that it will benefit "the public" and himself—we do not suppose he would hesitate at making the attempt to repair the sales of territory of the old Brooklyn's former management by simply overriding them. Failing this, he could absorb the Fulton-Municipal, whose free-lance charter permits it to go here, there and everywhere with its pipes, wherefore the Fulton-Municipal stock would to Mr. Addicks be worth a greater relative price to the old Brooklyn stock than the ratio mentioned above. It is also true that he could secure an available wedge in the Williamsburgh Company, which has the right to rove the city: and it goes without saying that these shares for such purposes would be worth a higher rate than those of the Fulton-Municipal; for the Williamsburgh plant rests alongside a stream (the East river) that will never be closed up, whereas the Fulton-Municipal would be high

and dry inland, were the Gowanus canal to be closed—a result that will be compelled by public sentiment before many years have passed. In this crude reference to the matter no mention has been made of the Nassau Company, the works of which are also located on waters that will ever remain a highway, for the reason that neither Mr. Addicks nor any of the other "syndicateers" is likely to budge it from the conservative position that it has always occupied in the gas supply of the city. It may be also taken for granted, no matter what the outcome of these negotiations is to be, that the Nassau Company will have much to say when the articles are being drawn that shall end the struggle—if it ever is terminated. Neither was any mention made of the Peoples Company, for its voice in the discussion will be merely the uttering of "me, too," to whatever the Nassau, the Williamsburgh and the Equity will put down as the law. No extended mention or reference to the Equity has been made, but anyone with any comprehension of the situation must admit that, while its position at present is a singular one, it occupies the easiest position of the lot. If Mr. Fanshawe and the President of the Equity Gas Company as well will not resent the suggestion, we might remark that it is a much more profitable operation to put a low money value (relatively, that is) on a good round issue of new securities than it is to keep a high money value on a good round issue of old securities, especially when the value of the latter is wholly dependent on the goodwill and pacific intentions of those who surround them.

While it is true that a complete merging of all the Companies in Brooklyn would result in a saving per year to the consolidated enterprise, over the cost of managing the factors to the merger on a separate basis, of not less than $50,000 per annum (or 5 per cent. per annum on an additional million of capital), we also believe that, at the present bid prices for the capital stocks of the separate Companies, which would call for an investment, between bonds and stocks, of fully $19,000,000, the gas business of Brooklyn would be unable to support the load, provided investors were to obtain 8 per cent. all round on their investments.

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A New Meter Making Firm.—Although we have known for some weeks that another meter manufacturing company had entered the field, we did not, until the closing days of December, receive official notification of the existence of the Company. The new enterprise solicits business under the title of the "Tufts Bros. Meter Company," with headquarters at 63 Beverly street, Boston. The partners in the firm are Eugene Tufts and Joseph P. Tufts.

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Notes.—On the evening of December 24th, which surely was a most appropriate time for such a notification, the employees of the Hartford City Gas Light Company were informed that the Company had decided to grant a substantial increase in the rates of remuneration for 1893. The rate of advance is uniform, applies to all grades in the service of the Company, and took effect on January 1. Elsewhere we note that the Company has declared a semi-annual dividend of 4 per cent.; and now that the shareholders and employees have been taken care of, we may confidently look forward to a reduction in the gas rate, for General-Manager Harbison is very seldom other than thorough.——Our advertising columns of to-day contain an intimation that the Riverside Gas and Electric Light Company, of Riverside, California, will receive proposals for the construction of a single-lift gasholder, rated to store 50,000 cubic feet. Superintendent McCollum will receive proposals up to noon of February 15th.——At the annual meeting of the Metropolitan Gas Light Company, of Brooklyn, N. Y., the following Directors were elected: Benjamin Brewster, Heber R. Bishop, James C. Bergen, Henry Beam, Anthony F. Campbell, Hugh McLaughlin, Alexander D. Napier, Charles H. Stoddard, Arthur F. Staniford and Jesse C. Woodhull. The changes in the Board are the replacement of Messrs. Rogers and Rockafellar (resigned), by Messrs. Woodhull and Staniford. The latter is the Secretary of the Company.——The plant and franchises of the Niagara Falls (N. Y.) Gas Light Company have been sold, presumably to those interested in the local electric lighting company.——James Mason, a Chicago plumber, was recently called in by the occupants of No. 67 Kinzie street, Chicago, to thaw out a frozen gas meter. His method of procedure was to pour kerosene oil into the outlet pipe and then apply a match. No. 67 Kinzie street now has a new meter, and the plumber paid for it.——The shareholders of the Mechanicsburg (Pa.) Gas and Water Company recently voted to lease their gas plant to New York capitalists, and the arrangements for making the final transfer are almost completed. The lessees will remodel the works, and the pipe lines will be overhauled and extended. Mr. Amos Z. Myers will, in all probability, remain in control of the works, as Manager for the purchasers.——Mr. John R. Cullinane, Manager of the Denison (Texas) Light and Power Company, was surprised, on Christmas morning, by the employees on the works, who presented him with a handsome watch charm.

## The Roberts-Burgess Regenerative Pottery Kiln.

*Iron Age*, in describing the Roberts-Burgess regenerative pottery kiln, says that the regenerative principle of securing high heats has been in use for a great many years in connection with heating and melting iron and steel, and it may be said that the progress in the economy of the production of iron and steel of late years has been largely due to this regenerative principle first introduced by Siemens. In principle the regenerative process depends upon the absorption, by fire brick or other suitable material, of the greater part of the waste heat in the flue leading to the chimney, and the subsequent returning of this heat to the heating chamber by imparting it to the gas and air while passing through this heated brick work on their way to the heating chamber.

In the iron and steel industries the regenerative principle is applied in brief as follows: The chamber in which the heating or melting is to be carried on is provided at each end with a flue leading to the chimney. In each of these flues a mass of fire brick is placed, built up so as to leave ample space between the bricks for the passage of the gases, and in plan resembling a checker board. These flues meet and thence continue as one flue to the chimney. At the point where the flues intersect reversing valves are provided, whereby the direction of the flow of gases within the heating chamber may be reversed, the products of combustion passing out alternately from each end. The fuel employed is gas. When one end of the heating chamber is open to the chimney the other is open to the influx of gas and air, which burn within the heating chamber. The products of combustion pass out of the opposite end of the chamber, and in so doing heat the mass of brick work in the chimney flue to a high heat. At the proper time the reversing valve mentioned above is turned, in consequence of which the end of the chamber which was before open to the influx of gas and air is now connected to the chimney, and that formerly connected to the chimney is now open to the passage of gas and air into the heating chamber. In making such passage, however, the gas and air are compelled to pass through the brick work which has been previously highly heated as described by the products of combustion, and consequently become themselves highly heated by contact with this brick work—the result being that the major portion of the heat in the escaping products in one operation is returned to the heating chamber through the medium of the gas and air in the next. The reversing process thus outlined is repeated from time to time as may be necessary. The economy in fuel resulting from the use of the regenerative principle is great, and in consequence there is no iron or steel works of modern design which is not equipped in one way or another with furnaces of this description. If, then, this principle has proved of such commercial value in the heating of iron and steel, why should it not be equally so in the burning of pottery ware? Let us examine into the question.

Many costly experiments have been undertaken from time to time with a view to the reduction of the cost of firing kilns. These experiments have been largely confined to the application of some particular kind of fuel. None have proved successful, however—and why? Because, not only is high temperature required (which was secured without difficulty), but large volume of heat is absolutely essential in order to fill the kiln chamber completely and perform the proper distribution of temperature. In regenerative furnaces, as a rule, the gas used for fuel is that known as producer gas, and this gas for a given amount of heat is greater in volume than any other gas used in the arts; roughly, a comparison of different gases may be taken as follows:

| | Volume per 140,000 Heat Units. | | Volume per 140,000 Heat Units. |
|---|---|---|---|
| Natural gas..... | 125 cubic feet. | Coal gas..... | 195 cubic feet. |
| Water gas..... | 429 cubic feet. | Producer gas.... | 1,000 cubic feet. |

Hence, in the use of producer gas, we satisfy the requirements that our fuel shall be such that the heating gases within the kiln shall be of large volume.

It would be impracticable as well as impossible to apply the regenerative principle as used in the iron industry to the requirements of the pottery trade. As has been indicated, the direction of the flow of the gases within the regenerative furnace of the iron works is reversed from time to time within the heating chamber itself. Manifestly this would not be suitable for a pottery kiln. The reversing of the currents would in this case vary the temperature of the two sides of the chamber to such an extent as to introduce serious defects in the ware. The regenerative system, then, in the case of the pottery kiln, must be modified to such an extent as to cause the currents within the kiln to flow continuously in one direction, whereby the saggers and ware will be gradually heated up to the maximum required temperature.

With these principles in view, Frank C. Roberts, of Philadelphia, in-

vented the kiln which is the subject of this article. The plans were submitted to William Burgess, of the International Pottery in Trenton, and he thought so well of the kiln that it was decided to remodel one of the kilns of the Company. Owing to Mr. Burgess' familiarity with the manufacture of pottery, he was able to render Mr. Roberts valuable assistance in meeting the requirements involved; in consequence of which, Mr. Burgess is associated with Mr. Roberts in the introduction of the kiln. The plant was completed and placed in operation, and although several difficulties were experienced, they were finally overcome and the system proved capable of a large saving in the cost of firing the kiln. It was clearly demonstrated, however, that much better work could be done if the kiln had been constructed entirely anew, and more than one kiln were equipped with the regenerative apparatus. Practically the most efficient and least expensive arrangement of plant

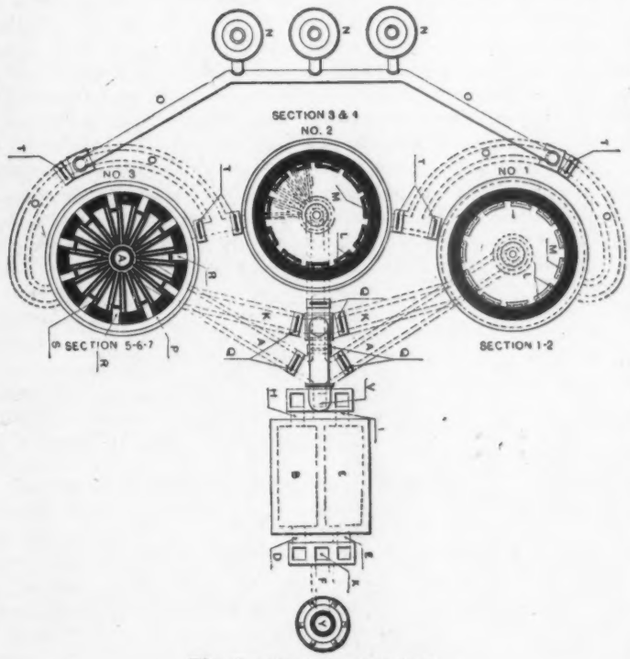



**Fig. 1.**—Plan of Three-Kiln Plant.

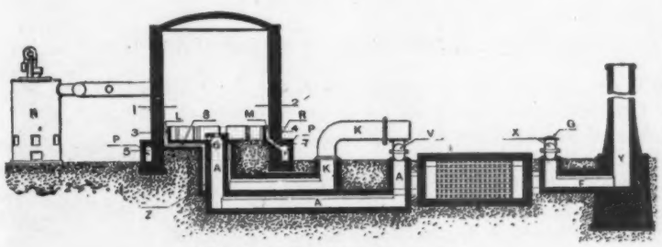


**Fig. 2.**—Sectional Elevation of Plant.

would be to employ but one pair of regenerative chambers for three kilns. By this means while one kiln is being fired another can be filling and another discharging. By this arrangement the regenerative chambers and gas producer are in use continually, thus effecting a large saving in heat over the single kiln at Trenton; where on completion of the firing the producers are stopped and the regenerative work of necessity allowed to cool.

Fig. 1 shows the plan of an arrangement of a plant of three kilns operated with one set of regenerative chambers in which the air is preheated, while Fig. 2 shows a sectional elevation of the plant taken through the chimney, regenerative chamber and one of the kilns. In Fig. 1 the kilns are represented by sections taken at different elevations, as may be noted by reference to the plan. The same letters on Figs. 1 and 3 represent the same parts in each case. The draft for the operation of the kilns is supplied by the chimney *Y*. The products of combustion are drawn out of the kiln through a central and several radial openings located in the bottom, and thence pass through flue *A* to the reversing valve *V*, which valve controls the direction of the flow of the products by diverting them through flues *H* or *I* into regenerative chambers *B* or *C*, as may be desired. The major part of the waste heat in the products of combustion is thus absorbed by the brick work in chambers *B* or *C*. Beyond these chambers and connected thereto by flues *D* and *E* is located another reversing valve, *X*, by means of which either of the regenerative chambers *B* or *C* is connected to the chimney *Y* through the flue *F*. So much for the outflowing products of combustion, the heat of which may be absorbed by either chamber *B* and *C*. The air for the combustion of the fuel in the kiln is drawn by the chimney draft into the system through the opening *G* in reversing valve *X*, and is regulated by a damper, as indicated. The reversing valve X deflects the air into either regenerative chamber *B* or *C*, where it becomes heated by contact with the hot brick work. Thence it passes through either flues *H* or *I* to the reversing valve *V*, which valve governs the flow of heated air from the chamber *B* or *C* just as the valve *X* controls the flow into either chamber. From this valve *V* the heated air passes by means of flue *K* to an annular chamber *Z* (see Fig. 2 and kiln 3 in Fig. 1) located in the center of the kiln and under the bottom, from whence it is carried by means of radial flues S (see kiln 3, Fig. 1) located directly beneath the floor of the kiln, to the openings *L* into the kiln, one of which openings is located on each side of the gas opening *M*. Attention is called to the fact that the radial flues *S* contribute largely to a "hot bottom." The design of the bottom is not limited to radial flues, however; any approved style of bottom may be used. The foregoing description covers the process by which the major part of the waste heat in the products escaping from the kiln is returned to the kiln.

Gas is manufactured in gas producers *N* and carried from thence to each kiln by flues *O*. Around the base of each kiln there is a circular gas flue, *P*, connected to the flue *O* at two points. From this flue, *P*, the gas is admitted to the kiln by the small flue *R* and the gas opening or burner *M*.

In order to render the matter somewhat clearer, the operation may be described, assuming that the regenerative chamber *B* has been heated and connected to air and that kiln No. 1 is being fired. The gas passes from the producer *N* to the gas burners *M* by flues *O*, *P* and *R*. Air is now necessary for combustion and is drawn by the draft of the chimney through opening valve *G*, valve *X*, flue *D*, regenerative chamber *B* (where the air is heated), flue *H*, valve *V*, flue *K*, to the chamber *Z* in center of kiln No. 1, from whence it is distributed to the air openings *L* by radial flues *S*, directly under the bottom. Thus air is provided for the combustion of the gas and the products of combustion are formed. These products are drawn by the chimney out of the kiln by means of a central and several radial openings in the floor to the flue *A* through valve *V*, flue *I*, regenerative chamber *C* (where their heat is imparted to the brick work), flue *E*, valve *X*, flue *F* and out of the chimney *Y*. From this description it is apparent that the direction of the flow of gases within the kiln is continuously in one direction and this important condition is thereby satisfied. Attention is also called to the fact that by a proper operation of the valves *Q* the heat remaining in one of the kilns on completion of firing may be used to heat the air required for the drying of the kiln about to be fired.

The plant has been described in which only the air is preheated for the reason that there are a less number of valves and regenerative chambers than that where both the gas and air are preheated; the principle is exactly the same, however, the chambers, flues, valves, etc., for heating the air being duplicated, thus providing a separate similar system for heating the gas. In order to disconnect the kilns not being fired from the regenerative chambers cut-off valves *Q* are provided in each flue; likewise cut-off valves *T* control the connections of the three kilns to the gas producers.

The gas may be manufactured in any first-class producer; that in use at Trenton is the Taylor gas producer, which has given great satisfaction. The coal used is anthracite pea coal; the use of this coal effects a large saving itself in the cost of firing a kiln, the cost per ton being about one half that of the coal usually employed at Trenton.

In regard to cost of plant, it may be mentioned that the kilns themselves cost about the same as the kilns in use at the present time, and when the cost of a single regenerative system with producers is divided between three kilns, the individual cost per kiln of the regenerative system is comparatively small.

The application of the regenerative system to pottery and other clay burning kilns leads to economy along the following lines:

(*a*) The possible saving of heat remaining in the kiln on completion of firing.

(*b*) The saving of the heat of the products of combustion.

(c) Reduced cost of fuel per ton.

The experiments at Trenton have demonstrated that the regenerative system applied to pottery kilns will lead to results as satisfactory in economy as any secured by the application of the system to the iron and

steel industries. As already stated, the conditions at the Trenton kiln are not at all favorable, the works being located on very low ground, and as a consequence there is water in the bottoms of the flues most of the time. Notwithstanding this, the last recorded test gives a fuel consumption of but 9 tons of low grade coal, showing a saving over the old methods of direct burning of over $45 per firing.

The principles involved in these kilns are applicable to a variety of purposes aside from that already referred to, and the promoters hope shortly to introduce the system into other fields of manufacture. These kilns are covered by patents, and it is the intention to allow their use by potters and other establishments on a royalty basis.

## Destructive and Conservative Distillation of Mineral Oils.

[A paper read by Mr. John Laing, before the Royal Scottish Society of Arts.]

The subject I wish to bring before you this evening is of a two-fold nature, the one being distillation of a destructive character and the other of a conservative character. Mineral oils, treated by the former method, are broken down into lighter products, but by the latter method it is intended to retain the full body of the oil and prevent its being broken down.

For several years past I have devoted considerable attention to the subject of destructive distillation of mineral oils, and I thought it would not be uninteresting to the members of the Society that I should bring the subject prominently before them, more especially as this Society has for its object the encouraging and promoting of inventions and improvements in our industries, as well as in all connected with science and art. Till within the last few years very little work has been done, comparatively speaking, in breaking down very heavy oils into lighter ones; but the subject now is ever increasing in importance, and I may safely say that it will not be long before we have a fair practical knowledge of the subject on a large scale.

Both on the continent and in the colonies there are unlimited supplies of natural oils of all grades and qualities. Some of them, like the American, very low in specific gravity, and others, like the Russian, very heavy, whilst we have all the intermediate grades. In a country like Russia there is any amount of outlet for burning oils, and as the bulk of the natural oil found there is very high in specific gravity, and the percentage of burning oil obtained therefrom is very small by ordinary fractional distillation, a process of destructive distillation which can be carried on with economy in working, and safety to life and property, must be of the greatest importance to that country, as well as to others similarly placed, and every day brings the demand for such a process more prominently to the front.

When mineral oil is being manufactured, as in this country, from shale, it is of the utmost importance that all vapors should be removed from the retort as soon as formed, and that removal should be conducted at as low a temperature as possible, for, if the gases have a long travel through a very high temperature before they leave the retort, they get split up and degraded to a wonderful extent; the hight melting point paraffines get reduced, the low melting point paraffines get split up into liquid hydrocarbons; the heavy lubricating oils get degraded into those of less viscosity, and what would form the burning oil portion gets split up into naphtha and permanent gas. I will now give you an illustration of this breaking down.

In my various experiments I was very much struck with the behavior of certain oils, and also of the same oil under treatment of refining. For instance, I found I could not get the same results from one individual crude oil when distilled under slightly different conditions in its various fractions. For example, I found that in distilling, say, 20,000 grain measures in 5 per cent. fractions in my usual still, I got certain results; but if I took 5,000 grains of the same oil and distilled that quantity under the same conditions in the same still, and took it off in 5 per cent. fractions, on comparing the fractions in both cases I did not get them to agree, the oil in the latter case being very much split up. Taking another 5,000 grains of the same oil, and distilling it in a smaller still, the capacity of which was one fourth of that of the larger one, I got the fractions to correspond more nearly; the setting points, viscosity and gravity of the various fractions were nearly the same as the distillate in the larger still.

I tried another experiment with the larger still, in the one instance using wide delivery tubes, and in the next distillation I used very narrow or small bore tubes; and I found I got a degraded oil in this second distillate, which corresponded, in a degree, with the distillate of the small quantity in the large still. I then fitted up another set of delivery tubes, having a stopcock arrangement so that I could regulate the outflow of the gases from the still, and I found that I could obtain results very different from anything I had yet got, according as I left a smaller or larger aperture for the gases to pass. I tried yet another experiment in a larger still with wide delivery tubes, but in this case I fed the still at the same rate as the distillate came off; in other words, I kept the still as nearly as possible at the same level, and I found that I got the best results by far of any of my former distillates. The smell was sweeter, gravity higher, paraffine of high melting point, greater in quantity, and the viscosity of the lubricating oil much higher, and the corresponding loss was less.

The conclusions I came to were that radiant heat was the cause of the degraded condition of the resulting oils, and that also pressure might assist this breaking down; for when I restrained the flow of vapors from the still it naturally put a back pressure on the still. Pressure pure and simple, without distilling heat, does not affect the oil. You may put on a pressure of 200 pounds per square inch in your still, and keep it at that for 24 hours, and your oil will be unchanged. If you take a high boiling point oil, say over 500° F., and heat up the contents of your still within its distilling point, ever so little, say to 500° F., and let it remain locked up under 150 pounds pressure per square inch, so that no vapors can possibly escape, and leave it so for 12 hours and let it cool down, you will find that the oil is changed very little indeed;

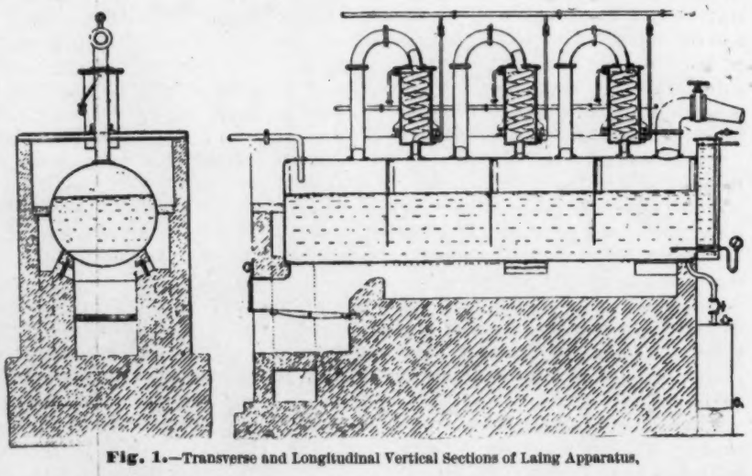


Fig. 1.—Transverse and Longitudinal Vertical Sections of Laing Apparatus.

the invisible molecular energy caused by the applied heat had not reached that point which was necessary to force the molecules so far apart as to break down the compound molecules.

What action, then, has pressure on an oil when distilled under its influence? It is simply this: It raises the boiling point, and thus necessitates the entrance of more heat into the oil for its evaporation, and the energy of this extra heat assists in breaking down the cohesive attraction of the compound molecules of which the oil is built up, and at the same time it keeps the gases in the still longer under the action of the radiant heat from the sides of the still above the level of the liquid inside; and as these sides or portions of the still allow more heat to enter the still than the bottom portion covered with a deep layer of oil, which is a bad conductor of heat, the gases held there by the pressure are constantly being split up, and lighter products formed. It is just a question of time; if you fire heavily, and bring away the vapors as fast as formed, you will get a heavier distillate than if you fired slow and kept your heat just high enough to evaporate your oil slowly. If you keep these vapors a lengthened period in contact with the upper portion of the still, the radiant heat will soon split them up, and a lighter distillate will be the result. If you take a works-still running heavy oil and paraffine, and for some reason or other the distillation had to be stopped and fire drawn, when you again fire up and commence distilling you will not get the same products at start as you left off running at, when the still was damped down; you will always get light spirit or naphtha at the start, and all the distillate to the end will be of a degraded character. Your solid paraffines have suffered, and the viscosity of your lubricating oil has got thinned down considerably. This is partly due to the oil vapors or compound molecules remaining in contact with the hot sides of the still above the liquid portion, and there getting broken down, falling back into the still, and, getting condensed, are ready to

come off at a lower heat when the fire is again put on, and yield a product of lighter specific gravity. It is upon this principle that "cracking stills" at present in use are worked.

The method employed is to have a high upright still and conduct the distillation so that the heavier vapors rising up in the still will fall back again and get condensed and re-distilled or evaporated. Of course, no steam must be employed in this distillation, else it would carry over the vapors from the still and prevent their remaining long enough to get broken down. This method has never been considered very satisfactory; the distillation is extremely slow, and large quantities of the lighter vapors get converted into permanent gas. What does all this point to? It shows us that there is a limit to which we ought to allow our stills to be fired when working for heavy oils. When distilling for lubricating oils get your gases out of your still as fast as possible: arrange your flues connected with the furnace so that the top portion of your boiler still is protected by being, to a certain extent, shut off from the hot gases from the combustion chamber. You will thus minimize the area where excessive radiant heat would do the most harm to the oil vapors; on the other hand, you must not have your still top too cold, as it would act, in a degree, as a condenser, and the heavier vapors falling back into the still would get split up by being re evaporated. Have as free an outlet as possible from the still, and that not too high from the boiler top. I would strongly recommend an exhausting arrangement be fitted to each still for "heavy oils and paraffine," so that the vapors would be more quickly removed and thus a lower temperature would be required to distil the oil than by the present method of distilling. Various opinions have been expressed as to the molecular condition of mineral oils, but none of them have been satisfactory to my mind. My own opinion is that mineral oils are made up of compound molecules of various sizes, and according as these compound molecules are large or small, so is the oil heavy or light, and it is the breaking down of these compound molecules into compound molecules of a smaller size which constitutes what is technically known as the "cracking" of oils. (I will have a few words to say on that subject further on.)

The oftener you distil a mineral oil you make it the lighter, and although you may begin with a heavy oil your first fractions in distillation will always be comparatively lighter than the fractions which built it up; and if you go on distilling this oil, over and over again, and so breaking it down, you will gradually come to very light material, which soon gets split up into permanent gas, and all you have left is a little carbon at the bottom of your still. There has always been a difficulty in obtaining a distillate of uniformly low specific gravity throughout, without entailing too great a loss through permanent gas, and it is greatly to overcome this difficulty that I have devised the apparatus before you.

It consists of a divided boiler, whose compartments do not reach the bottom. This allows a free way throughout for its contents. Thus, the still when first charged will stand with all its compartments at the same level with oil. On the top of the still is a series of condensers, arranged so that the gases from the first compartment pass over, get condensed, and fall into the second compartment; then the gases from the second compartment pass over, get condensed, and fall into the third compartment, and so on to end of the still, where they finally pass over by the swan neck leading to the main condenser in connection with the general receiving tank. In using this apparatus, the greatest heat is to be applied to the end compartment furthest from the swan neck, and it is tapered off gradually towards the opposite end. Some may be inclined to think that because there is a free way all along the bottom of the still that the contents will heat up uniformly *en masse*, but this is not the case; heat currents have always an upward tendency—never a transverse one from their first source—and as you have a graduated heat under the still, so each compartment has a corresponding difference in temperature.

I will show this by a very simple experiment. Here is a glass tube bent so that one leg rises from a lower level than the other, *i. e.*, the two upright legs rise from an oblique base; in other words, the legs are parallel, but they are not at right angles with the base. Fill this tube three-quarters full of water, and of course it will stand at the same level in both legs; but now let us apply heat to the highest point of the base, and you will find that the water will actually boil in that leg while the other remains comparatively cool; not only so, but you will find that the water has increased in bulk in that boiling leg. If you now apply the heat to the opposite end of base, keeping the lamp just sufficiently inward to clear the upright leg, you will find that the heat currents will pass along the base, and up the far off leg, rather than take to the nearer one, simply because they would have to force themselves downwards to arrive at the nearer leg—the natural tendency being upwards. We are accustomed to say that "water gains its own level." We ought to qualify that statement by saying "water of *uniform temperature* gains its own level."

(To be continued.)

## Inventor Edison Again Sustained

The following is the full text of the decision of the United States Circuit Court of Appeals in the matter of the Edison General Electric Company *vs.* the United States Electric Lighting Company (otherwise the Westinghouse Company):

This is an appeal from an order of the Circuit Court granting an injunction *pendente lite* restraining the defendant from making, using, or vending the incandescent electric lamps of the patent granted to Thomas A. Edison, January 27, 1880, No. 223,898, of which the complainants are the owners. The order was granted *pro forma*, in view that a final disposition of the questions involved might be promptly made by the decision of this court,

The validity of the patent, and the infringement of its second claim by such lamps as the defendant makes, were adjudged by the Circuit Court for the southern district of New York, July 14, 1891, in a decree at final hearing. That suit was brought against the United States Electric Lighting Company, and was defended by the Westinghouse Electric Company, a corporation which since October 10, 1888, has been the owner of the business carried on in the name of the present defendant. The business of the defendant consists exclusively in the manufacture of the infringing lamps. The decree of the Circuit Court adjudging the validity of the second claim of the patent, and its infringement by lamps such as are made by the defendant, was upon an appeal affirmed by this court October 4, 1892. That decree among other things awarded the complainants a perpetual injunction. The present suit was brought subsequently to that affirmance.

It is apparent that the order for the present injunction is in effect one to extend the terms of an injunction already granted in a suit determined by the court of last resort between the same parties, or their privies, so as to include a new infringement. For an understanding of the grounds upon which the defendant contends the injunction ought not to have been granted, the following narrative is necessary:

For several years subsequent to 1880 the Edison Company and the United States Electric Lighting Company were the only manufacturers of incandescent lighting apparatus in this country doing any considerable business. The United States Electric Lighting Company began manufacturing incandescent lighting apparatus, including the lamps which have been held to be an infringement of the Edison patent, in the summer of 1880, and continued in such business until a recent period. In May, 1885, a suit was brought against it upon the present patent. Another corporation, Consolidated Electric Lighting Company, was organized in September, 1882, and began the manufacture of incandescent lighting apparatus. This company was the owner of and operated under what are known as the Sawyer Man patents for electric lighting apparatus; and under these patents it assumed that it had the exclusive right to make and sell the lamp claimed in the patent in suit. In May, 1885, suit was brought against it by the Edison Electric Light Company upon the patent in suit, and about the same time it brought suit against the Edison Company for infringement of its own patent. In 1883 a corporation known as the Thomson Houston Company began the manufacture and sale of electric apparatus for lighting and power. As the result of negotiations between the Consolidated Electric Lighting Company and the Thomson-Houston Company the Sawyer-Man Company, the present defendant, was organized in September, 1886. Nine-tenths of its stock was owned by the Thomson-Houston Company. It received from the Consolidated Company a license to manufacture lamps under the Sawyer Man patents, and thereupon began the business of manufacturing the infringing lamp, and has continued in this business to the present time. In August, 1887, all the stock of the defendant, including that owned by the Thomson-Houston Company, was sold to the Consolidated Company for $120,000 in bonds, and the same amount at par of its stock. In December, 1888, the T.-H. Company sold its stock in the Consolidated Company to the Westinghouse Electric Company. At the same time, by an agreement between the Consolidated Company and the Westinghouse Company, the fulfillment of which on the part of the Consolidated Company was guaranteed by the Westinghouse Company, the Thomson-Houston Company was licensed under the patents of the Consolidated Company to make incandescent lamps for export and use with generating apparatus of its own manufacture in this country; and the Westinghouse Company was prohibited from selling incandescent lamps for use with the Thomson-

Houston generating apparatus for a period which might, at the option of the Thomson-Houston Company, extend to 1892. This agreement recognized the fact that the Thomson Houston Company could during the continuance of the agreement make and sell lamps not covered by the Consolidated Company's patent; and in the event of such manufacture and sale, the latter company was released from its obligations not to sell lamps for use in connection with the Thomson Houston generating apparatus. Pending the suit against the United States Electric Company, the Westinghouse Company succeeded to the business of the United States Company, the Consolidated Company, and the defendant; and since September, 1888, the defendant has been the manufacturer of lamps for the Westinghouse system. Each of the various companies engaged in the manufacture and sale of electric lighting apparatus has, as a rule, manufactured all the different pieces of apparatus which are necessary for making up a complete "plant," the different parts being constructed with reference to use with each other, and not so as to be adapted for use in the systems of apparatus made by other manufacturers. For the purpose of public lighting from central stations local companies, known as illuminating companies, have been organized in various cities and towns, which have purchased plants from one or the other of the manufacturing companies, and the central stations of such illuminating companies have, as a rule, been equipped wholly with the electrical apparatus made by some one manufacturing company. In many cities and towns there are competing illuminating companies using the system of different manufacturers, some being equipped with the Edison system, some with the Westinghouse system, and some with the Thomson-Houston system.

The United States Company has installed about 1,050 plants, with a lamp capacity of about 350,000 lamps. About 300 of these plants were installed before the suit upon the patent was brought against it. The Consolidated Company also installed a large number of plants. After the Westinghouse Company succeeded to the business of the United States Company and the Consolidated Company, it also installed a large number of plants.

It is said that the aggregate lamp capacity of the incandescent lighting plants installed with generating apparatus supplied by the Westinghouse Company at the present time represents a capital of about $25,000,000, and a lamp capacity of over 1,300,000 lamps. The lamps themselves represent but a small part of the cost of the plants, the greater part being represented by the electric apparatus supplied by the Westinghouse Company and its predecessors; but the lamps are essential for the continued operation of the plants. Unless the lamps can be replaced as they are worn out, and can be procured when needed, these plants will be crippled and the greater part of the investment in them will be lost. The central station plants supply lights to customers as gas companies supply gas; and if their operation should be stopped great inconvenience to the public would ensue. The various companies give employment to a large number of men who might be thrown out of employment if the lamps could not be obtained.

In 1889 the Edison General Electric Company was organized for the purpose of combining the Edison Electric Light Company with various other corporations engaged in the manufacture and sale of electric apparatus, the organization of the subordinate corporations being retained. Prior to April, 1892, the Thomson-Houston Company had acquired the stocks of various other companies engaged in the business of manufacturing and selling electrical apparatus, and these companies were carrying on the business in combination with the Thomson-Houston Company and under its control. In April, 1892, these two combinations, the Edison General Electric Company and the Thomson-Houston Electric Company, included substantially all the companies which had theretofore been competing in this kind of business, excepting the Westinghouse Company; and in that month the General Electric Company was organized for the purpose of combining these two combinations in one which should include all the concerns in this country, except the Westinghouse Company, which formerly were competing in the business of making and selling electric light and power apparatus, but the separate organization of the constituent companies was still retained.

The defendant insists that the preliminary injunction should not have been granted because, (1) owing to the laches of the owners of the patent in asserting their claims and enforcing them, a large capital has been invested in the manufacture and sale, not only of lamps, but also in electric lighting apparatus, which will be greatly depreciated in value unless the lamps can be used with it, and that an injunction will cripple and perhaps ruin the local illuminating companies who have invested in the plants of the Westinghouse Companies if they are prevented from using the lamp of the patent, and thereby subject to great inconvenience those whom these plants furnish with light, and displace a large number of persons who are employed in operating the plants; (2) because the complainants and the other corporations with whom the complainants are associated, the competitors of the Westinghouse Company, in the business of making and supplying electric power and lighting, have entered into an unlawful combination to stifle competition in that business, and an injunction will be used unconscionably to further the objects of the combination; and (3) because by reason of the affiliation of the Thomson-Houston Company with that combination, and prior dealing of that company with the defendant, the Consolidated Company and the Westinghouse Company, an equitable estoppel has arisen by force of which the complainants, as parties to the combination, ought not to be permitted to have an injunction. The question whether there has been any laches in asserting the patent was considered by the Circuit Court of Appeals upon the appeal from the decree of the Circuit Court, and that court declared that no case was shown to authorize the refusal of an injunction on any theory of laches or equitable estoppel by reason of undue delay in bringing suit, or acquiescence in known infringement. If the owners of the patent proceeded with due diligence as respects the United States Lighting Company, no other infringers of the patent can be heard to complain with reason that suit was not brought against them upon the patent previous to the adjudication of its validity in the Circuit Court. It is a matter of notoriety that that litigation was a very expensive and arduous one, and its progress must have been familiar to all those who were extensively interested in having the patent defeated. As regards the present defendant, there are no new facts of importance bearing upon the question of laches to distinguish the case from that shown in the former suit. We see no reason for changing the opinion expressed by this court in the former case, and do not deem it necessary, because the same defense has again been urged upon substantially the same state of facts, to add anything to that opinion.

Every one of the manufacturing corporations, the competitors of the Edison Companies, commenced their operations with a knowledge of the existence of the patent in suit. They were controlled by business men of intelligence and experience. Their promoters and managers may have believed, and probably did, that the patent could not be successfully maintained. But they entered upon the business with an understanding of its risks, and of the consequences which would befall them as infringers, if the patent should be sustained. None of them can now be justly heard to say that an injunction which is essential, if not indispensable, to the protection of the owners of the patent and their licensees, ought not to be granted because of the great pecuniary loss which may result. If in consequence of being deprived of the use of the lamps, their investments in other electric apparatus will be greatly depreciated, they must take the consequences.

The users who have supplied themselves with electric lighting plants from the infringers, which required for their operation lamps of the patent, are of course infringers. But those who did so before the decision of the Circuit Court sustaining the patent, and at a time when judicial decisions in foreign countries interpreting the patent were in conflict, and who are now willing to accept their lamps from the complainants upon reasonable terms, have much stronger equities than the manufacturing infringers. These equities the court will not disregard; but what would be reasonable terms if an application were made to the court on behalf of these users is a question which can only be determined in each case upon its particular circumstances.

As to those users, however, who have acquired these plants subsequent to the decision of the Circuit Court, if they are deprived of the use of the lamps, and as a consequence the value of their plants may be greatly impaired, they must accept the result as a consequence of their own imprudence.

We are not disposed to investigate upon the present case the character of the combination which has been formed under the name of the General Electric Company. Whether that combination is intended to fetter competition, and is illegal as one in restraint of trade, is a question which we should not undertake to decide upon the evidence before us, and in a suit to which it is not a party. The present complainants are entitled by the patent laws to a monopoly for the term of the patent, of the manufacture and sale of the lamps made under it; the right to this monopoly is the very foundation of the patent system. They do not lose that right merely because they may have joined in a combination with others holding other patents securing similar monopolies, which combination may, when judicially examined in a proper forum, be held to be unlawful. We do not feel justified in assuming upon the facts before us in the present suit that the use which the complainants propose to make of the injunction, an injunction which seems necessary to secure their monopoly and make their patent fruitful, will be such as to pro-

mote any other monopoly. When it shall be made to appear that some one, to whom in fairness and good conscience these complainants should sell their lamps, has been arbitrarily refused them, save upon oppressive and unreasonable terms, it will be time to consider whether the complainants should be allowed to continue in possession of the injunction.

The alleged estoppel seems to be far fetched and shadowy. The history which has been given shows that before the Sawyer-Man Company was organized litigation upon the patent in suit and upon the Sawyer-Man patents had commenced; that in 1887 the stock in the Sawyer-Man Company, owned by the Thomson-Houston Company, was sold to the Consolidated Company, a party to the suits, and that subsequently, in 1888, the Westinghouse Company, an actual party to the litigation, bought that portion of the stock from the Consolidated Company which had been owned by the Thomson-Houston Company. The estoppel lacks the elements which ordinarily create an estoppel in pais, namely, an injury or a harm to one person resulting from a reliance upon the acts, conduct or declarations of another, in which there was an element of bad faith or wilful neglect of duty. The history of the connection of the Thomson-Houston Company from 1886 to 1888 with the Consolidated Company and with the Sawyer-Man Company, the defendant, shows that all these Companies knew of the existence of the litigations in which the life of the present patent and of the Sawyer-Man patent was at stake. There can be no charge of concealment or constructive fraud. When the sale and the agreement of 1888 were made there was no implied obligation upon the Thomson-Houston Company to remain in alliance with the Westinghouse system. The contingency that it might enter upon the manufacture of competing lamps was contemplated. Its union with the Edison interests has neither hastened nor facilitated the application for the present injunction. We perceive no adequate reason from the facts why the complainants should not obtain the ordinary results which attend a complaint's success in a suit in equity for the infringement of a patent.

The injunction order appealed from should be modified so as to cover only lamps made in infringement of the second claim of the patent, the other claims not having been infringed according to the adjudication of the Circuit Court of this Court. It should also contain a provision reserving the right to the defendant to move hereafter for the vacation, suspension or modification of the injunction upon proof of specific instances of refusal on the part of the complainants, or either of them, to supply the lamps of the patent upon terms reasonable under the circumstances of the particular case, to the owners of electric lighting plants which were installed before the rendition of the interlocutory decree of the Circuit Court sustaining the validity of the patent.

## The Improved Welsbach Incandescent Gas Light.

The London *Journal* in referring to the improved Welsbach lamp says:

It will be in the recollection of our readers that considerable interest was aroused a few years ago by the introduction of the new system of incandescent gas lighting devised by Dr. Auer von Welsbach. The merits of the new light were duly appreciated, and it was employed in a great number of establishments; but practical experience of its use revealed certain defects which militated against its very general adoption. The chief objection to the system was one which struck at its vital principle. The mantle of refractory material by which the light was produced was found to be too fragile, and its life too short, to enable consumers to realize the full economy claimed for it. These drawbacks were fully recognized by the inventor of the light and by those who were endeavoring to make it a commercial success; and they very prudently turned their attention to the removal of them. The result has been the production of a mantle which, as far as we have been able to learn, is much more satisfactory than any of its predecessors.

The improvements that have been effected in the system will be manifest from the following figures: When the Welsbach burner was first brought out, the light obtained from it with a consumption of 2.75 cubic feet of gas per hour was from 20 to 25 candles, or an average of 8 candles per cubic foot. Now, with the same quantity of gas a light of from 50 to 60 candles is produced, or an average of nineteen candles per cubic foot. This improved lighting power is due to the changes introduced into the method of manufacturing the mantles; one of the principal ingredients with which they are impregnated being subjected to a delicate chemical process which heightens their luminosity. With regard to their durability—a very important point—great advance has been made in this respect. The mantles produced under the old process would not last more than 800 hours—that is to say, for doing really good work. After having been in use for this period, their efficiency decreased considerably. Those which are now being made have, we are informed, burnt for upwards of 3,000 hours with a loss of not more than 25 per cent.

This long life is not, however, claimed by the exploiters of the light (the Incandescent Gas Light Company, Limited) as general; 1,000 hours being estimated by them as the duration of the mantle for practical purposes. We learn that the improvements which have been effected in the Welsbach system have resulted in a marked extension of incandescent gas lighting in Austria, where it has received the serious attention of all interested in the supply of coal gas; and the result has been to counteract to a very large extent the adoption of electric lighting. In fact, several large installations of the latter system in Vienna have, we understand, been discarded in favor of incandescent gas lighting, with which nearly every establishment of any importance is now illuminated. It is only during the present year that the above-named Company have been able to develop the improved Welsbach system in a practical form in England; but the success which has already attended their efforts in this direction shows unmistakably that the changes made have produced a light which is giving great satisfaction.

Of course, it is not for a moment proposed on behalf of the Company—it would be useless to do so—to put forward the Welsbach incandescent burners in competition with the large gas lamps of the regenerative type which are now so largely and so effectively employed for shop as well as private lighting; but, apart from these, it would, we think, be difficult to find in the market any system of gas lighting possessing the special qualities of economical and efficient illumination, combined with hygienic advantages, which are claimed for the Welsbach light as now manufactured.

## Hearne's Improved Center Seal.

On November 8, 1892, U. S. Letters Patent (No. 485,629) were granted to Mr. John Hearne (subsequently he assigned a one-half interest in same to Mr. W. P. Elliot, of New Brunswick, N. J.), for an improvement in center seals. Using the words of the specification, the inventor supplies the following description of the construction:

My improvement relates to a class of valves termed "center seals" and employed in conjunction with a number of gas purifiers (usually four) to direct the gas into and out of said purifiers.

I will describe in detail a center seal embodying my improvement, and then point out the novel features it claims.

In the accompanying drawings, Figure 1 is a plan or top view of a center seal embodying my improvement with the top plate removed. Fig. 2 is a similar view, but showing the parts in a somewhat different position. Fig. 3 is a vertical section of the same, taken on the line $x\,x$, Fig. 1. Fig. 4 is a detail of a portion of a cock employed. Similar letters and numerals of reference designate corresponding parts in all the figures.

*A* designates the seal or valve shell, shown as cylindrical, and having a closed bottom and open top. Arranged centrally within the shell *A* is a cup shaped portion *B*, which is also cylindrical and is in communication at its lower end with the inner end of an inlet port *a*, through which unpurified gas is admitted to the interior of the seal. The portion *B* constitutes in effect a continuation of said inlet port and is flush with the upper edge of the shell *A*.

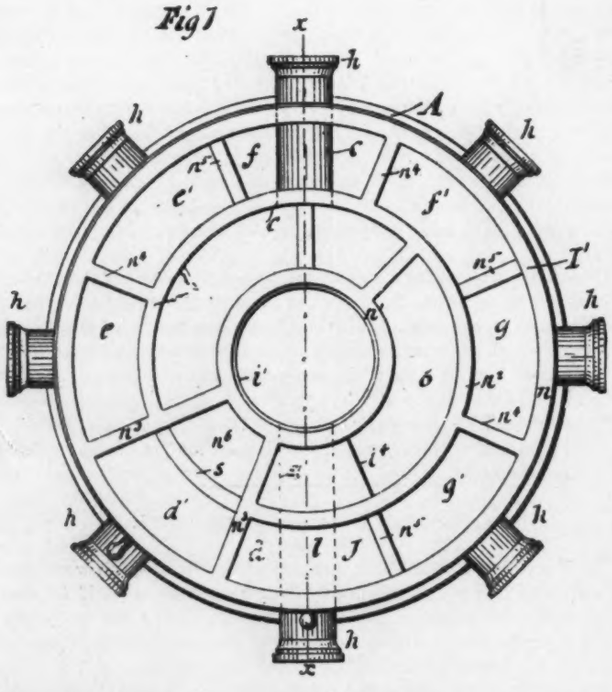
*C* designates a wall or partition, also cylindrical, and rising from the bottom of the valve shell and flush with the top thereof. This portion is arranged intermediate of the outer wall of the shell and the cup shaped portion *B*. Between the wall *C* and the cup shaped portion *B* is an annular space *b*. The inner end of an outlet port *c* communicates with the annular space *b*. Purified gas is received in the annular space *b* and passes out through the outlet port *c*.

Extending between the portion *C* and the outer wall of the shell are in this example of my improvement eight radially extending partitions *D*. These partitions are flush with the upper edge of the valve shell and divide the space between the partition *C* and the outer wall of the shell into eight compartments. These compartments operate in pairs when the seal is in use, as *d* $d^1$, *e* $e^1$, *f* $f^1$, and *g* $g^1$. Each of the compartments has a port *h*, communicating with its interior and the exterior of the valve shell. Into each of the compartments *d e f g* is or may be received unpurified gas in manner about to be described. Such unpurified gas passes thence through the port *h* to a gas purifier in the well known manner, and is from the purifier returned to the compartments $d^1$, $e^1$, $f^1$, or $g^1$, as the case may be, from which latter it may be passed directly to the outlet port *c* or to one or more of the purifiers in communication with the seal, as desired. In the present example four puri-

fiers will be arranged to operate in conjunction with the seal, one with each pair of compartments $d$ $d^1$, etc.

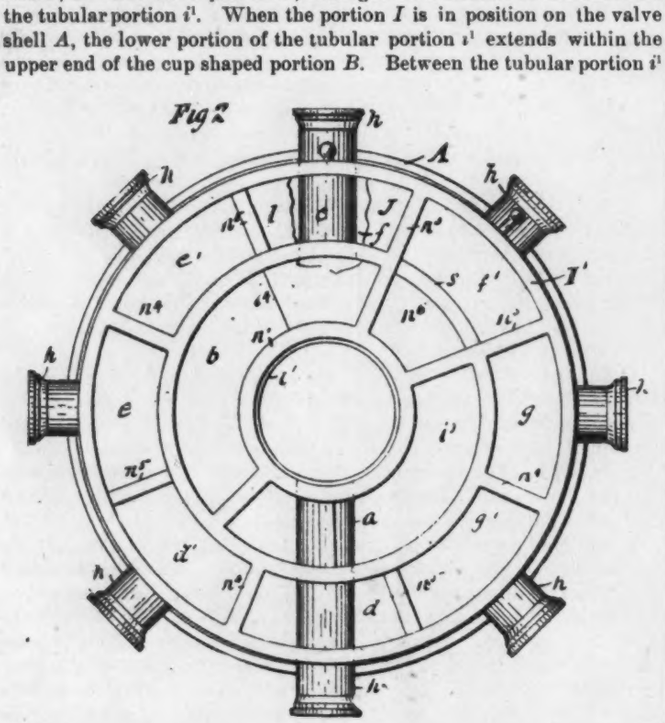
$I$ $I^1$ designate the valve cock. These parts when rotated operate in conjunction with each other and with the valve shell to direct unpurified or purified gas in any desired direction and to and through any desired number of the compartments $d$ $d^1$, etc., and consequently to any desired purifier or purifiers in the series. The portion $I$ is superposed

Fig 1




directly upon the valve shell $A$ and may be rotated thereon. This portion consists of an outer rim $i$, an inner centrally arranged tubular portion $i^1$, and a circular portion $i^2$, arranged intermediate of the rim $i$ and the tubular portion $i^1$. When the portion $I$ is in position on the valve shell $A$, the lower portion of the tubular portion $i^1$ extends within the upper end of the cup shaped portion $B$. Between the tubular portion $i^1$

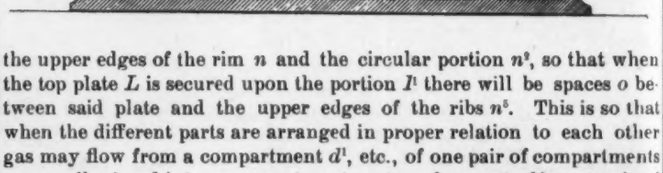
Fig 2




and the circular portion $i^2$ is a space $i^3$, corresponding to the space $b$. Extending between the circular portion $i^2$ and the rim $i$ are radial ribs $i^4$, corresponding in number and arrangement to the partitions $D$. The circular portion $i^2$ and the ribs $i^4$ are flush both top and bottom with the upper and lower edges of the rim $i$, and their surfaces, as well as those of said rim, are ground to form gas tight joints when in position. The tubular portion $i^1$ forms in effect a continuation of the inlet port $a$. Communicating with the interior of said tubular portion $i^1$ is one end of a gas passage $J$. This passage is formed by plates $l$ $l^1$, arranged between two of the ribs $i^4$, so as to leave a space between them. The ribs $i^4$ between which the plates $l$ $l^1$ are arranged extend to the tubular portion $i^1$. The plate $l^1$ stops short of the rim $i$, so that an opening is left by which communication may be established between the inlet port $a$ for unpurified gas and either of the compartments $d$ $e$ $f$ $g$ by suitably rotating the portion $I$.

The portion $I^1$ of the cock resembles the portion $I$ in that it has an outer rim $n$, a central ringlike or tubular portion $n^1$, and an intemediate circular portion $n^2$. All these portions have flush upper and lower surfaces, which are ground to form gas-tight joints. The ringlike portion $n^1$ fits over the upper part of the tubular portion $i^1$ when the portion $I^1$ is in position on the portion $I$. Extending between the rim $n$ and the circular portion $n^2$ are ribs $n^3$ $n^4$ $n^5$. The ribs $n^3$ also extend between the circular portion $n^2$ and the ringlike portion $n$, forming a space $n^6$ between them which is over the space $b$, except when above the gas passage $J$. The ribs $n^3$ $n^4$ are flush both top and bottom with the upper and lower sides of the rim $n$, and are likewise ground to form gas tight joints. The ribs $n^5$ are flush upon their lower sides with the said rim, and are also ground; but upon their upper sides they do not extend to

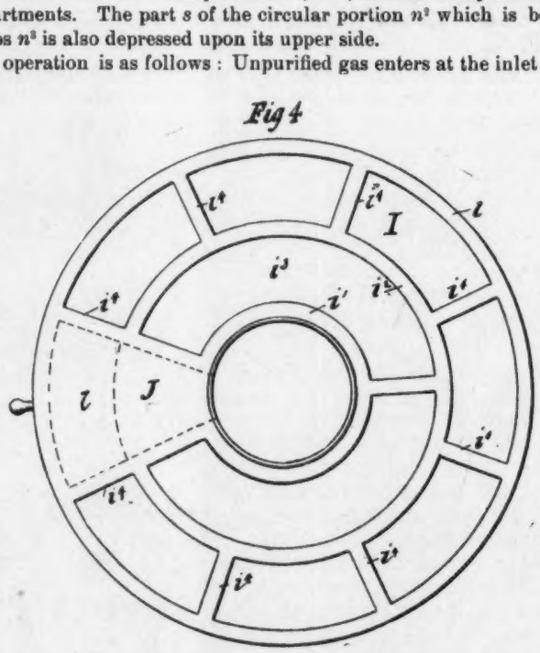
Fig 3




the upper edges of the rim $n$ and the circular portion $n^2$, so that when the top plate $L$ is secured upon the portion $I^1$ there will be spaces $o$ between said plate and the upper edges of the ribs $n^5$. This is so that when the different parts are arranged in proper relation to each other gas may flow from a compartment $d^1$, etc., of one pair of compartments over a rib $n^5$ and into a compartment $e$, etc., of a next adjacent pair of compartments. The part $s$ of the circular portion $n^2$ which is between the ribs $n^5$ is also depressed upon its upper side.

The operation is as follows: Unpurified gas enters at the inlet port $a$

Fig 4




and passes upwardly through the cup shaped portion $B$ and tubular portion $i^1$ to the gas passage $J$. Assume that the open outer end of the gas passage is over the compartment $d$ and the portion $I^1$ of the cock has been rotated so as to bring the space between the ribs $n^3$ over the compartment $d^1$, as shown more clearly in Fig. 1. Gas will then flow through the compartment $d$ and the port $h$ to a purifier, and from thence

will return to the compartment $d^1$, passing up over the part $s$ of the circular portion $n^2$, down into the space $b$, and thence through the outlet port $c$. Thus the gas is caused to pass through but one purifier—say a purifier which I will designate for clearness "No. 1." If it is desired that it pass through purifiers Nos. 1 and 2, the portion $I^1$ is given a quarter turn to the right, the portion $I$ remaining stationary. The gas will then pass from the compartment $d^1$ into the compartment $e$, from thence to purifier No. 2, returning to compartment $e^1$, and thence over part $s$ and out, as before. Another quarter turn of the portion $I^1$ will cause the gas to pass in similar manner through purifiers Nos. 1, 2 and 3, and still another quarter turn through purifiers 1, 2, 3, and 4. Of course portion $I^1$ may be rotated in the reverse direction to put in all four purifiers at once, if desired. By this arrangement it will be seen that one or any desired number of the purifiers may be put into communication with the center seal.

There is, however, an additional operation. Suppose it is desired to cut out purifier No. 1, leaving in 2, 3 and 4, or any of them. The portion $I$ of the cock is rotated so as to bring the gas passage $J$ over the compartment $e$. No. 1 will then be cut out and the point of beginning of rotation of the portion $I^1$ will be at $e^1$, and by rotating said part purifiers 3 and 4 may be successively brought into operation, as desired. Again, by rotating $I^1$ so that the gas passage is over $f$, as shown in Fig. 2, purifier No. 2 may be cut out and Nos. 3, 4 and 1 brought in, or any of them, as desired, and so on. It will, therefore, be readily seen that by properly rotating the portions $I\,I^1$ of the cock relatively to each other and the valve shell, any desired number of purifiers, or any particular purifier or purifiers may be brought into or out of communication with the center seal. This is very advantageous, because it not only admits of all four purifiers being brought into operation at once, but also makes it possible to renew an exhausted purifier or purifiers wherever located in the series without disturbing the operation of any of the other purifiers in the series, neither of which is possible with center seals as at present constructed. My improvement, therefore, results in a material increase in capacity, besides a marked saving in time and labor.

The claims for novelty made by the inventor are:

1. In a center seal, the combination, with a valve shell closed at one end and open at the other and having inlet and outlet ports and divided into pairs of compartments, of inlet and outlet ports for each of said pair of compartments, a cock superposed upon the valve shell and comprising two parts constructed and arranged to be rotated in unison or independently of each other, the one of said parts next the valve shell being provided with the gas passage $J$ and the ribs $i^4$ and the other of said parts being provided with the ribs $n^2$, a gas passage to the outlet port of the valve between them, the ribs $n^4$, and gas passages arranged intermediate of the ribs $n^4$ and affording communication between adjacent pairs of compartments, the ribs $n^4$ $i^4$ forming gas tight joints arranged the one above the other, substantially as specified.

2. In a center seal, the combination of a closed casing, inlet and outlet pipes, a passage divided by partitions into a plurality of chambers communicating with the purifiers, a skeleton valve working gas tight in said casing and divided by partitions corresponding to those in the passage, into an equal number of chambers with those connected with the purifiers and having a separate passageway whereby communication may be established between the inlet pipe and any one of the chambers connected with the purifiers, and an auxiliary skeleton valve overlying the main valve and working gas tight between it and the top of the casing, said auxiliary valve being divided into chambers by partitions corresponding with alternate partitions in the main valve and having a separate passageway whereby communication may be established between the outlet and any one of the chambers connecting with the purifiers, substantially as described.

3. In a center seal, the combination of a closed casing, concentric inlet and outlet chambers, an annular concentric passage divided by radial partitions into a plurality of chambers communicating with the purifiers, a rotary skeleton valve working gas tight in said casing and divided by radial partitions corresponding to those in the concentric passage into an equal number of chambers with those connected with the purifiers and having a separate passageway whereby communication may be established between the inlet pipe and any one of the chambers connected with the purifiers, and an auxiliary rotary skeleton valve overlying the main valve and working gas tight between it and the top of the casing, said auxiliary valve being divided into chambers by partitions corresponding with alternate partitions in the main valve and having a separate passageway whereby communication may be established between any one of the chambers connecting with the purifiers and outlet pipe, substantially as described.

## SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, December 10, 1892.

*A New Basis for Charging—An Explosion—Gas at the Scientific Associations.*

History repeats itself. An old "saw" relates that a parson once called on a publican for a contribution to the church expenses. "I never go to church," objected the son of Bacchus. "But the church is open to you every Sunday," replied the minister. A small subscription was then handed over, and the parson went away thinking the matter was concluded. But the next day, to his surprise, he received a bill from the publican comprising a claim for sundry grogs, cigars, etc. Full of rage he hastened to the innkeeper. "What do you mean by that?" he demanded. "I'm a tetotaller, and don't smoke. I never had these things." "You did not," replied the other, with a triumphant smile; "but you might have had them. My inn is open every day."

So much for the original. To find the modern repetition we must turn to an address recently delivered by Dr. John Hopkinson, F R.S., to the Junior Engineering Society. The speaker, who is amongst our most eminent authorities on electrical matters, discoursed eloquently on the cost of generating and distributing electricity, dwelling especially on the expense incurred in being ready to supply, in contra-distinction to actually supplying. Attention was directed to the fact that practically no more plant would be required to supply any given quantity of electricity continuously, day and night, than to supply it for only one hour out of the twenty-four. This was further illustrated by two hypothetical examples. In one the plant is supposed to be always at work, and the other, although always in readiness, it is very rarely in actual operation. The practical conditions of every undertaking lay somewhere between these two extremes. The figures show that by far the greater proportion of the working expenses may be classed under the head of "readiness to supply," and this argument forms the basis of a proposed system of charging. Instead of putting down so much per unit or per lamp, Dr. Hopkinson would start with a fixed charge per lamp put in circuit, entirely irrespective of whether it was used one hour or 5,000 hours in the year. When that lamp is connected up, the electric company are expected to supply whenever it is wanted, and it is argued that this alone constitutes a fair marketable commodity. Then, in addition to the fixed charge, a comparatively low rate per unit is charged for the electricity actually used. To meet the objection that some people may have as regards paying for what they do not use, it is proposed to retain the present system of charging so much per unit, and to give customers the option of paying upon either basis, as preferred.

There is a marked resemblance between this plan and the suggestion* that has been put forward at one of the American Gas Associations, that every gas consumer should be charged a fixed sum per annum according to the size of his service. But there is this important difference—that the gas engineer only looked for a fair return on the cost of the service itself, and did not touch upon the value of the readiness to supply. In some parts we find gas companies charged with being rapacious and covetous; but what would the public say if it was proposed to put as the first item of the much abused gas bill a fixed sum proportioned to the size of the service, intended to represent a charge for the privilege of being able to light up a gas jet whenever it is wanted. It should also be noted that such a system must be compulsory if it is to be of any advantage to the suppliers. If two systems of charging are at the choice of a purchaser, he will naturally select the one that is more favorable to himself. It follows, therefore, that when one of the systems is already established, the addition of the other must result in one of two things. The majority of the consumers will keep to the old plan, or else there will be a loss to the company. A small temporary gain may be secured, while the new plan is being tried, but the consumer will soon settle down to the plan that is now to his advantage, and consequently less to that of the company.

I do not question the soundness of the argument. It is a fact that the item of "readiness to supply" does form an important part of the working expenses of any undertaking distributing gas, electricity, water or anything else from a central station. The greater the degree of intermittence or irregularity in demand, the greater will be the proportionate magnitude of this item to the whole. A large consumer under the system of a fixed rate per unit helps to pay for the "readiness to supply" a small consumer. Such a system would be a remedy for the difficulties that have occasionally arisen on account of the desire on the part of a

* "Meter Rents—A Question of Equity and Policy," by Walton Clark, JOURNAL, Nov. 16, 1891, p. 686.

customer to keep a large service pipe and meter always on tap, not for regular use, but as a safeguard in case of failure of the electric light. Taken all round it is more just and fair than the present system of so much per 1,000 cubic feet or per unit. But admitting all this, the difficulty is to get the man who pays the bill to accept it, and especially the small and intermittent class of customers who profit most by the present arrangements, and would consequently have more to pay under the new one. All that has been said at gas managers' meetings about introducing summer consumption, or increasing the consumption per consumer by the introduction of stoves, etc., is simply another way of reducing the proportion between the cost of "readiness to supply" and that of actually supplying, by inducing a more steady and regular demand.

One of the most serious accidents that has ever occurred at a gas works took place at Bradford on Saturday last.* An explosion of gas occurred in the tar tank, which is situated underground in a yard near to the retort house, and is described as strongly constructed of brick and concrete. It was of sufficient violence to cause a kind of volcanic upheaval, not only immediately over, but extending several yards round, that was strong enough to reduce buildings or apparatus to a shapeless heap of *debris*. The works foreman was killed, four men badly injured, and a horse was also killed. So far as may be judged from the published accounts of the accident, it would appear fortunate that the list of casualties was not longer.

Some extent of the severe nature of the injury to the plant may be gathered by the statement that the producing power is reduced about one-fourth, a most serious matter at this season of the year. It is rather singular that attention was directed to the risks of such accidents by a paper† read before the Manchester District Association of Gas Engineers, by Mr. Chester, of Nottingham, only a few days before, and which comprised some account of a similar accident, but fortunately unattended with serious consequences, which occurred at Nottingham a few months ago. The author ascribed the cause to gas carried mechanically through the seal by the liquid from the scrubber, and drew the lesson therefrom that this apparatus should not be supplied with more liquor than was found to be absolutely necessary. It was also suggested, in the discussion, that tar would retain inflammable vapors and give them off at a very moderate increase of temperature. Evidence as to the cause of the Bradford disaster will be forthcoming in due course, and it will be better to wait for this than to speculate upon the meager information at present to hand.

Illuminating gas is receiving a very fair amount of attention from scientific associations this season. First, there are a series of four lectures, now being delivered on Monday evenings at the rooms of the Society of Arts, by Professor Lewes, Chief Gas Examiner to the City of London Corporation, on the subject of the generation of light from coal gas. A very noticeable advance has taken place within the last few years in respect to burners for developing the lighting power of coal gas. It is not so long ago that the batwing and fishtail, with Sugg's argand, completed the list of these appliances. Now we have many forms of combination or multi-flame burners, several makes of regenerative burners, modifications of the argand, such as that produced by placing a flat disc or button an inch or so above the orifice, and two or three kinds of incandescent lights. Yet with all this enterprise and energy, the burner makers have been guided by experiments partaking of the rule of thumb order, rather than by actual investigation into the nature of the chemical and other changes that obtain in the various parts of a gas flame. One or two stock notions, such as the effect of heating the gas and air supply, as pointed out by the late Sir W. Siemens, constitute all their stock in trade in the department. If they are able, understanding such disadvantages, to make such a marked improvement, what may we expect when they have the help of facts such as those which Professor Lewes is now "bringing to light" in the course of his lectures. Then the Institution of Civil Engineers, who not long ago listened to a paper on artificial lighting, will next week take a paper on "Gas Power for Electric Lighting," contributed by Mr. J. E. Dowson. This is quite one of the questions of the day, for it is probable that the use of electricity by means of private installations, having the whole plant, generating and otherwise, on the premises, increases in a greater ratio than the supply by public companies. So far as gas companies are concerned, the use of gas engines in connection with accumulators, which are charged by running the machinery all day or for as many hours as may be necessary, is a great advantage, and more to be desired than the use of an equivalent number of gas burners during the usual hours of lighting. But if the gas engine is to run at full power during the heaviest hours of evening consumption, the result is not altogether an unmixed blessing. It should also be mentioned that Mr. Dowson advocates the use of large engines, driven by generator gas, as a substitute for steam engines as a source of motive power at the generating stations worked by electric companies. In this way he extends the well known advantages of gas as compared with steam on the small scale for all kinds of intermittent work. The gas engine can be started or stopped at a moment's notice, it uses no fuel whilst standing idle, and the quantity of gas consumed is proportioned in some measure to the amount of work done.

The various properties and uses of petroleum and its products, and liquid hydrocarbons generally, as gas producing or enriching agents, continue to attract a fair share of attention, and it is likely that they will gradually work their way, slowly, perhaps, but surely none the less, into our English gas works.

* December 3d.

† See JOURNAL, Dec. 19, p. 876.

## Calorific Value of Liquid Fuel.

In a lecture on the "Uses of Petroleum in Prime Movers," by Prof. W. Robinson, M.E., before the English Society of Arts, the speaker made the following reference to the matter noted in the heading:

From the careful and elaborate experimental researches of Messrs. Favre and Silbermann, Dr. Andrews and others, we know the quantity of heat obtained by the complete combustion of 1 pound of solid carbon when burned in pure oxygen in a calorimeter surrounded with cold water; and also the heat generated by burning 1 pound of gaseous hydrogen under similar conditions. Then assuming, from the ultimate chemical composition of a fuel, that it is made up of solid carbon and gaseous hydrogen, mixed loosely together in certain proportions, we may make a rough estimate of the heating value of the fuel, by calculating the heat given out by these constituents burning separately. Here we entirely ignore the obvious fact that the amount of heat generated by the combustion of a fuel depends not only upon its physical state, but also upon its proximate chemical constitution, which may be wholly unknown. Moreover, it is well known that numerous hydrocarbons, having different properties, are made up of the same proportions of carbon and hydrogen, and yet give out different amounts of heat in burning, because of the heat spent in the internal work of tearing the ultimate particles apart where the carbon and hydrogen are more tightly held together in the more stable substances. In the simple case of pure carbon, the quantity of heat evolved, in burning the different varieties of carbon to form carbonic acid, changes with the density. Favre and Silbermann found the following values for the calorific power:

| | Pound-Centigrade Heat Units. | Pound-Fahr. British Thermal Units. |
|---|---|---|
| Carbon of wood charcoal..... | 8,080.0 | 14,544 |
| Gas retort carbon (denser).... | 8,047.3 | 14,485 |
| Natural graphite..... | 7,796.6 | 14,034 |
| Diamond..... | 7,770.1 | 13,986 |

Notwithstanding this variation, the value generally taken for the carbon in liquid and solid fuel alike is that of wood charcoal, although the calorific power of carbon vapor is 11,214 calories, or 20,185 British thermal units.

Again, a similar error is made in calculating the calorific power of hydrogen in various hydrocarbons as if it were in the separate gaseous state in the liquid fuel, which we know is not the case. Then gaseous hydrogen is burned in pure oxygen to form steam, and in the calorimeter there is reckoned not merely the heat generated during the combustion, but that evolved in cooling down the steam to the boiling point, also in condensing the steam and subsequent cooling of the condensed steam down to the ordinary temperature of the atmosphere (59° or 60° F.), and the sum of all these quantities of heat is called the calorific power of hydrogen.

Now, when burning a fuel containing hydrogen in the ordinary furnace, we do not condense the steam and cool the water formed to 60° F. Consequently, we cannot expect to find the total heat value of hydrogen realized. In the same way, when carbon is burned to form carbonic acid, the heat evolved in simply cooling this gas is reckoned as part of the heating power of the carbon. In the experiments of Favre and Silbermann only very small quantities of charcoal, about 38 grains, were burned at a time, and a variable proportion, sometimes 30 per cent., of carbonic oxide was found among the products, showing incomplete combustion or reduction of carbonic acid gas formed, and thus necessitating corrections in order to arrive at the total heat that should be evolved in the complete combustion of the solid carbon with oxygen. These conditions do not closely agree with the physical state of carbon in liquid hydrocarbons, which are readily decomposed in the presence of high

pressure steam, yielding gaseous hydrocarbons, especially compounds like olefiant gas, having a high heating power, with deposit of solid carbon. Marsh gas, $CH_4$, is found, by experiment, to develop 2,672 heat units per pound less, whilst olefines give out more heat than the ordinary calculation would indicate.

It would, therefore, appear better, in dealing with petroleum oils as fuel, to gain some idea of the proximate chemical constitution of an oil, of the constituent fractions or gases into which it is most likely to be split up by heat as in fractional distillation or in the furnace, and to base the estimate of heating power as that of the gases produced therefrom. Thus mineral oils yield a large proportion of olefiant gas and marsh gas.

When burning solid fuel, it is necessary to introduce into the ordinary furnaces about twice the amount of air required to furnish the oxygen for combustion. Part of the generated heat is spent in raising the temperature of the excess air or nitrogen. In the case of liquids, less surplus air is required, and gases are still more favorable for perfect furnace conditions.

Bearing in mind the uncertainty about the calculation of the calorific values of these oils, founded on the ultimate chemical composition given from analysis, we shall proceed to estimate the heating value of a sample or two in the ordinary way.

According to calorimetric experiments, the total amount of heat that can be obtained at ordinary atmospheric temperature, 60° F., by the combustion of the fuel and subsequent cooling of the burnt products, including condensation of steam formed, is from

| | British Thermal Units. |
|---|---|
| 1 lb. of pure carbon, about..... | 14,500 |
| 1 lb. of hydrogen, about..... .... | 62,000 |

If, then, C and H stand for the percentages of carbon and hydrogen present in 1 lb. of the fuel, its total heat of combustion in calorimeter, when the steam produced is condensed, is given by the sum of the products:

$$14{,}500 \times C + 62{,}000 \times H.$$

All the other constituents are neglected.

Now, since the heating value of hydrogen is nearly 4.28 times that of carbon, we may write the simple approximation to the heating power thus:

$$\text{Calorimetric value 1 lb. of fuel.} \left\{ \begin{array}{l} \text{British thermal units,} \\ = 14{,}500\,(C + 4.28\,H.) \end{array} \right.$$

Professor Rankine pointed out that a convenient thermal unit for evaporation is the heat required to evaporate 1 lb. of water under the mean atmospheric pressure of 14.7 lb. per square inch, the water being supplied to the boiler at 212° F., or 100° C., the boiling point of water. This unit of evaporation is the quantity of heat required to evaporate 1 lb. of water at 212° F., that is, the latent heat of evaporation, which is 966 British thermal units. The *evaporative power* of a fuel is the number of pounds of water that 1 lb. of the fuel can evaporate at mean atmospheric pressure from and at 212° F.

If we start with water at the ordinary temperature, say 62° F., and heat 1 lb. of it up through 150° to the boiling point, 212° F., we should require 150 British thermal units to the boiling point, and then 966 British thermal units would be spent in the evaporation of the 1 lb. of water at 212°; so that, altogether, the amount of heat required to heat up and change 1 lb. of water from 62° F. into 1 lb. of steam at 212°, under the mean atmospheric pressure of 14.7 lbs. per square inch, is 150 to 966, or 1,116 British thermal units.

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Last week we referred to the intention of Ald. Whiteside, of the Chattanooga (Tenn.) City Council, to introduce an ordinance looking to the regulation of the gas rate of that city by the Council. He has carried out the intention by presenting an ordinance, entitled, "An ordinance to regulate the price and quality of gas supplied to the city of Chattanooga and the public by the Chattanooga Gas Light Company," the first section of which is as follows: "Be it ordained by the Mayor and Aldermen of the city of Chattanooga, and by the authority of the same, it is hereby ordered that the Chattanooga Gas Light Company shall be allowed to charge and collect from the city and inhabitants of Chattanooga and the public for gas the prices herein prescribed and named, and no more. The maximum price for illuminating gas, $1 per 1,000 cubic feet; the maximum charge for fuel purposes, 75 cents per 1,000 cubic feet; meter rent shall not exceed 10 cents per month."

Chattanooga is now supplied with gas under a differential rate, varying from $1.25 to $1.40 per 1,000, net, for a lighting service, while the net rate on fuel account is $1.10 per 1,000. The gas suppliers at large have always looked upon the Chattanooga schedules as extremely liberal ones to the consumers, and the service of the Chattanooga Company has been fairly well maintained. As the annual output of the Company is not in excess of 50,000,000 cubic feet, it is self-evident that, as the proposed Whiteside schedules would cause the manufacture and sale of gas in that city to be carried on at a loss to the manufacturers, the ordinance would not hold in a court of law, should it eventually secure the sanction of the local authorities, the granting of which we very much doubt. Of course, the Company will not remain quiescent.

By consent of and agreement between counsel, the petitions of the citizens of Dorchester, South Boston and Roxbury for a hearing before the Massachusetts Board of Gas and Electric Light Commissioners for reduced gas rates, which were to have been heard on the morning of Dec. 22, were postponed until Wednesday, April 12, 1893. "Observer," in furnishing us this information, adds that "the Honorable Moody Merrill, counsel for the petitioners, stated that the latter were desirous of waiting until the high candle power gas promised by the Boston Gas Company had been tried, when, if it proved a success, they would be contented with the same arrangement, and would not ask for a cheaper price. They would also like to have the matter of fuel gas arranged as the Boston Company is to arrange it for the consumers of Boston. Taking everything into consideration, he thought it would be better to have the matter laid on the table for a short time. He further remarked that some people were of the opinion that the promise of the increase in candle power was all a myth, and they would like to see if the Company really meant to perform that which they had promised."

The Chicago *Tribune*, in editorially commenting on the movement that is now in process of agitation to commit the city to the operation of a municipal gas plant, as well as a municipal electric lighting plant, says: "The Council has adopted resolutions asking the Legislature so to amend the city charter as to give the municipality the power to furnish the inhabitants electricity for light, heat and power, and also to give it authority to manufacture its own gas. The last part of the petition should not be granted. The city ought not to go into the manufacture of gas for private or public use. Gas is a decaying illuminant which is being forced out of the field by electricity. Even if this were not the case the manufacture of gas by the city would mean another general tearing up of the streets, a great outlay for plant, and a very small return. There is no reason, however, why the city should not do its own electric lighting in whole as well as in part, nor why it should not furnish electricity to private parties along the line of its wires, provided the plants are run with some approach to economy and efficiency, and are not taken in hand by the ward politicians. If the city should have an electric light department, which was managed as the water office has been, the business would be a costly one for the taxpayers. The fact must not be lost sight of that the city has a monopoly so far as the supply of water is concerned, but that if it goes into the electric business and bids for private custom it will enter into competition with private companies. In order to get and keep customers it will have to perform as good service as the competing companies, and as cheaply. Therefore, to succeed it will have to imitate the economic and businesslike methods of the latter. Collections will have to be made more thoroughly than in the Water Office. If the Department of Electricity is to be as supersaturated with politics as other departments it will be a source of grievous expense. One of the resolutions calls for amendment of the City Incorporation Act, so that cities and towns may be in a position to issue bonds and to construct the necessary appliances for the purpose of this resolution. As Chicago has exceeded the constitutional limitation of indebtedness no law can be passed which will enable it to issue bonds with which to get the money to erect buildings and buy machinery and material for the electric lighting of the city. Whatever is done will have to be done slowly, which is the best way. The city has extended its present plant gradually as its income permitted. It will have to stick to that until it begins to get surplus revenue from the light or power it furnishes private parties. Then it can extend its field of operation more rapidly. Nothing will be gained by going to the legislature with a scheme to evade the law so that a large amount of money can be expended at once by the city for electrical plants."

All of which may be taken for what it is worth, and in our belief it is not worth taking very seriously. Of course, it matters little what argument the *Tribune* man uses to convince himself and his readers of the poor policy of the city taking a try at manufacturing gas on general account, as long as he believes that it would not be a good thing to do.

Still, we are unable to ignore or pass by in silence the evidence of his unfamiliarity with the gas business, *per se*, of his own city. And so, "gas is a decaying illuminant?"—an extremely amusing remark for a Chicago man, above all others, to make. If a wonderful increase in vitality is proof of the decay of any "person, place or thing, that can be known or mentioned," then the gas industry of the country in general, and of Chicago in particular, is in a fair way to smell badly in the near future—in fact, it ought to be giving off a pretty rank odor at the present time. A greater sample of the falsity of his belief could not be instanced than in the very one cited by him, for it is a notorious fact in the gas history of the country that no more pronounced instance of gas expansion is afforded in any other city (unless it be New York) of the country than has been afforded by the growth of the Chicago Gas Company's business in the past five years. The cold facts are that that business is sufficient to pay a handsome interest earning yearly on almost 40 millions of dollars. Now, if the *Tribune* man had advised against municipal gas making, or even an attempt at the same, on the score that because of a contract recently entered into between the city and the Chicago Gas Light and Coke Company, under which the latter promised for a term of years to cut its gas rate, under certain well defined conditions, and to pay into the city treasury a certain percentage of its annual receipts, it would be a violation of pledged faith, he would have been talking more to the point; but, as before remarked, the gas men can calmly accept any reason, as long as the effect of it is that gas can "keep on decaying" in Chicago in that radical way which nature revivifies things temporal, without having for a partner a municipal gas factory. The *Tribune* man makes out a pretty good case why Chicago should not go too deeply into electric lighting on municipal account, although he might have gone a bit further and said that private enterprise in that city, if all the expenditures justly chargeable to the operation of the present municipal electric lighting enterprise were put to their proper accounts, could and would save the city money by furnishing to the city the lights that it now supplies to itself.

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THE Wilmington (Del.) City Electric Company has placed the contract for its new boiler house with the Berlin Iron Bridge Company, of East Berlin, Conn. The building will be made entirely of brick and iron, from the designs of the Bridge Company.

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AT the annual meeting of the stockholders in the Oneida (N. Y.) Gas Light Company, the foltowing Directors were re-elected: Hon. George Berry and Messrs. David H. Walrath, Walter E. Northrup, S. H. Farnham and Henry S. Klock. The Directors subsequently perfected the following organization: President, Walter E. Northrup; Secretary and Treasurer, Henry S. Klock. The Company's affairs are in good condition, in testimony whereof a dividend of 3 per cent. on the capital was declared, payable on and after the 10th inst.

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WE are enabled to say that the Greenpoint Chemical Works, at Greenpoint avenue and Newtown Creek, Brooklyn, N. Y., which were recently destroyed by fire, will be (in fact, are being) replaced by a larger and better equipped structure, and it is intended that the plant shall be in working order by the 15th inst. The new plant will be three times as large as the one that was destroyed, so Manager Schriever will be in position to meet promptly any demand made for the Company's specialties, the main one, of course, being iron mass for gas purification. We congratulate him upon the celerity with which the damage was repaired.

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THE cast iron pipe founders of the country have about arranged for a consolidation of the different works. The territory will be divided into Eastern and Western divisions, at the beginning, at any rate; for it is also said that the ultimate object is to merge all the interests. A conservative estimate places the total output of the cast iron plants of the country at 540,000 gross tons per annum.

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THE Committee on Light, of the Richmond (Va.) Councils, will soon be in the market for bids on that auxilliary water gas plant to be erected at the city gas works. If the Committee were bound to take up in a practical way the matter of manufacturing water gas, it is rather surprising they did not vote a larger appropriation than the sum of $25,000 agreed upon.

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THE City Council of Youngstown, O., is very much stirred up over the public lighting. Having first attacked the gas rates, and having appointed a special committee to wrestle with that subject, Mr. Flannery turned his attention to the matter of the electric light service. Having spoken at length on the poor quality of the arcs maintained, he moved that the question of securing better service be referred to the City Commissioners for investigation, and to determine what power the Council had to compel better service. This was adopted, whereupon Mr. McGinniss moved that a committee be appointed to inquire into the advisability of the putting up of a plant by the city; also, to ascertain the cost of such plant and the expense of running the same. Mr. Flannery favored the motion, saying that he was heartily in favor of the city operating such a plant. Mr. Chase believed this was a move in the right direction, and thought the time "was rife" when the city should not be dictated to by a corporation. He thought the city, through owning its own plant, could in a few years, from the profit of operating the same, save its cost. The lights would be better than those now paid for, and they could be kept alight all night. Other places of the size of Youngstown owned their plants, and in every instance the operation was a success. Mr. McGinnis, returning to the charge, stated that he made the motion because he was convinced of the advisability of the city owning its own plant. There was an immense amount of complaint made by the mill-workers of the city because the arcs were lighted in accordance with a moontable, wherefore the city was in darkness half the night. He agreed with Messrs. Flannery and Chase that the time had arrived for the city to take the step suggested. Solicitor Justice thought the motion was not sufficiently comprehensive, in that it failed to provide for defraying the necessary expenses of the committee, who, no doubt, would find it imperative upon them to visit other cities to acquire information respecting the size, cost and mode of conducting plants in other cities. Mr. McGinnis at once saw the point, and amended the resolution on the line suggested. It was then put and carried.

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THE proprietors of the Pomona (Cal.) Gas and Electric Light Company have determined to put the gas rate at $2 per 1,000 cubic feet, a concession of not less than 33⅓ per cent.

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MR. CHAS. A. RICHARDSON, formerly in the counting room of the Lowell (Mass.) Gas Light Company, has accepted the position of cashier and paymaster to the Lowell & Suburban Street Railway Company.

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THE Board of Directors of the Hartford City (Conn.) Gas Light Company have declared a semi annuul dividend of 4 per cent. on the capital stock, payable on and after to-morrow, to stockholders of record of the 23d ult. This goes to show that the Quartermaster-General of the State of Connecticut is not neglecting the victories that belong to peace and commerce. By-the-way, he will be officially introduced as Quartermaster-General in the State House, Hartford, on Wednesday next.

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IT seems that we did not have our reference to the Poughkeepsie (N. Y.) itinerant gas meter inspector in perfect accord with the facts, as these transpired, both before and after his appearance in the chief residential center of Dutchess county. Now, however, owing to the courtesy of a correspondent at that point, we can give an authentic history of the affair. It seems that some weeks ago a canvasser, who said he represented the Hoyt Meter Inspection Company (which is reputed to have its headquarters at No. 117 West 42d street, New York), visited Poughkeepsie and secured applications from 25 to 30 gas consumers, who desired a test made of their gas meters—all this was done without consultation with anyone connected with the Gas Company. Following the canvasser, came a plumber, carrying with him a very dilapidated and doubtful testing apparatus; the plumber journeyed to the residence of one of the applicants who doubted his meter, and while the former was "hitching up" for the test, the latter told him that Manager John Tracy, of the Poughkeepsie Gas Company, had taken out a warrant for the arrest of the first person who attempted to test a gas meter that could not produce an authorization under the State law for the making of such a test. This worried the plumber considerably, caused him to suspend operations and to inquire for the office of the Gas Company. He then visited Mr. Tracy, who in his very impressive way informed the plumber that he was liable to arrest, with a possible maximum penalty, on conviction, of having tampered with a gas meter, of imprisonment for one year and a fine of $100. The plumber wilted very much at this, and whined out that the "Inspection Company" had shipped him to Poughkeepsie with only $1.50 in his pocket, which had been expended for transportation expenses, hence he was penniless—it is fair to presume that he was to have collected on the spot the testing fees, which would soon have put him in funds. Manager Tracy thereupon said he would pay the plumber's fare back to New York, but would be obliged to retain the testing apparatus for security. The itinerant went direct to his employers in New York, and reported the plight in which he was, only to be met with the response that he had been "bluffed." It might also be in order to state that on leaving Poughkeepsie the plumber said he would return for the testing apparatus in company with his "boss."

Tracy got out another warrant—the last one presumably being for the "boss"—and waited for developments. In a short time the plumber returned alone—the boss, it seemed, would not take any chances—paid Mr. Tracy the $1.50 and received his "testing apparatus." He then freed his mind by remarking that he had gotten through with the "Inspection Company," as he was satisfied those interested in it were not exactly like Cleveland in straightforwardness, nor like Vanderbilt for riches; in fact, he was about to sue the concern for the salary that they had agreed to pay him. Adding that the Inspection Company would shortly send another "inspector" to Poughkeepsie, he said good-bye to Mr. Tracy, and took a train for New York. Heeding the plumber's last intimation, Mr. Tracy retains possession of the warrant, so as to be in readiness for the Hoyt Inspection Company's next representative.

A CORRESPONDENT at Iowa City, Iowa, writing to the JOURNAL under date of the 23d inst., incloses the following: "The supply of gas in this city is well carried out by the Iowa City Gas Light Company—one of the oldest companies in the State—which is superintended by Mr. Daniel Davis, whose every effort is put forth to secure a first class service to the public. The residence portion of the city is amply supplied with gas street lamps, and the supply to the public buildings, residences and stores is well maintained. The Company has handsome offices and warerooms in the uptown district, in which a complete line of gas cookers and heaters can be examined. Superintendent Davis is a firm believer in advocating the use of gas for purposes other than lighting, and as a result very many gas cookers and heaters are in use. Mr. Davis has been with the Company for 18 years, and if an increased and increasing output is to be the test of his capability, he ought to be very well satisfied. It is also worthy of note that the increase in the Company's sendout for the past twelvemonth is larger than any other reported in its history—an increase gained in the face of the active competition of two electric lighting companies."

THE Board of Directors of the Metropolitan Gas Company, of Brooklyn, N. Y., at a meeting held a few days ago, unanimously refused to recommend to the shareholders the proposition submitted by Mr. J. E. Addicks for the purchase of the stock of the Company.

THE proprietors of the Houston (Texas) Gas Light Company are constantly keeping before the residents the comfort that springs from the use of gas for cooking and heating. One of their latest devices to this end is the mailing to every consumer of a tag, closely resembling the well-known Dennison type of shipping tags, to which is attached a burner cleaner. The card tells in plainly printed instructions how to use the cleaner or reamer, and the reverse side sounds the praises of the gas stove.

WE are pleased to be able to chronicle the recovery of Mr. Charles E. Davenport, Secretary of the Troy (N. Y.,) Gas Company, who has returned to his desk after an illness of many weeks.

"OBSERVER" forwards the following, respecting the action of the Directors of the Newport (R. I.,) Gas Company, at a meeting held towards the close of December: "The Directors of the Newport Gas Company have decided to make a reduction in the price of gas to all consumers, the reduction to take effect on all gas consumed from January 1st. The Company, in its bid for light for the city under the next contract, made a reduction in price, and this has now been followed by reducing the price to all others. The old rate was $1.70 per 1,000 cubic feet, with a reduction of 20 cents per 1,000 for prompt payment of bills. The new price will be $1.50 gross and $1.40 net per 1,000 feet. The price of gas to general consumers has been less than in any other city in New England, of anything near the size, or gas-consuming capacity of Newport, and the reduction now announced will make this even more so. But few of the largest cities in New England are supplied with gas for general use as low as it will now be furnished in this city. The reduction is made voluntarily, without any demand by the consumers, and because the Company feels that, with low prices, the consumption will increase, and in the end yield satisfactory returns, the present plant of the Company being capable of supplying much more than is now consumed."

WE are indebted to a correspondent at Chicago, Ill., for the following, regarding the movement at Terre Haute, Ind., for a third gas company: "The Council ordinance, which nominally is an attempt to secure cheaper gas for the city, but which is in reality a scheme to put in the field a third gas company, is said to be the outcome of a revolt of the consumers against a consolidation of the two existing companies and the establishment of a monopoly. The ordinance gives to the Consumers Gas Company, the proposed new organization, the right to lay mains. The story of the gas war in this city is an interesting one. About the time oil was discovered here, the Citizens' Fuel Gas Company was organized with the purpose of making gas from the cheap oil. Several of the main streets were piped, and the price of gas was fixed at 35 cents per 1,000 for either fuel or illumination. The old Company, the one that had a monopoly in the city for many years, reduced its price from $1.25 to meet the 35 cent rate. The Citizens' Company found that consumers who 'ought to have come to it' in recognition of what it had done to secure cheaper gas, remained with the old Company. The result was that while the consumption in the winter months was large enough to make the business profitable, there was a loss in the summer. Then followed overtures from the old Company for the purchase of its young rival. A majority of the stockholders in the latter signed an agreement to sell. The fact leaked to the public, as did also the purpose of the old Company to restore the price, the first raise to be to $1, and to go into effect November 1. There was much indignation, especially among the people who, in the past two years, had bought gas stoves, which they could not afford to use at the increased price of gas. Stove dealers estimated that $100,000 had been invested in these stoves. A public meeting was called, at which there was a decided expression of the opinion that the old Company was about to resume its merciless treatment of the gas consumers of the city. The newspapers, without exception, were outspoken in opposition to the deal. Gentlemen connected with the Citizens' Company said gas could be furnished at a profit at 35 cents, and certainly so at 50 cents, with a daily consumption of 200,000 feet. The result of the popular uprising was a hitch in the negotiations for the sale of the new to the old Company, and within the past few weeks it was declared off. Public sentiment was too strong for some of those interested to oppose. The direct result of the public meeting was the informal organization of the Consumers' Company, whose representatives immediately set about getting consumers to sign a contract to use its gas for five years, with the guarantee that the price was never to be more than 50 cents. About 1,500 signatures were obtained of the largest consumers in the city. Since then the Citizens Company is making a renewed effort to hold its own, and at a recent meeting voted down a proposition to raise the price to 60 cents. The plan now is to give the Consumers Company the right to use the streets, so that at any time there is danger of an increase in the price, to begin operations. It is not improbable, however, that the Citizens Company will accept the 1,500 contracts, and, signing like ones with its subscribers who are not among the 1,500, be assured of sufficient patronage to continue furnishing cheap gas for five years to come. * * * * The articles of incorporation of the Consumers Company were filed on December 21, with a capital of $100,000. The incorporators are ex-Secretary of the Navy Thompson, E. H. Bindley, Joseph Strong, W. L. Kidder, B. F. Swafford, Max Joseph and Charles Stahl."

THE above, which was furnished to all the Western newspapers on date of December 21, is given as a sample of the rot which, going the rounds of the daily press, is accepted as truth by those, who, not being practical gas men, as gas consumers, cannot detect the rot that is in it. It is true that there was and is a war of gas rates at Terre Haute, and it is also true that both parties to the contest are losing money. It is also true that both Companies to the contest will continue to lose money until the rates are restored to a point that will at least pay the actual expenses of making and distributing the gas, which expense cannot be met at the 50-cent rate. In our opinion, the gas companies at Terre Haute cannot fairly make both ends meet, on actual expenditure's account, unless they receive 70 cents per 1,000; and 90 cents per 1,000 must be obtained before the proprietors can secure that fair interest return on their investment to which they are entitled by every commercial principle. The chartering of another Company can only result in adding to the confusion existing in the gas supply of Terre Haute, and to postponing the time when gas can even be sold profitably at 90 cents per 1,000 in that city. The proprietors of the Citizens Fuel Gas Company know, too, that this is the plain, unvarnished truth, and they know it because of the lack of any interest return on the money that was put in that enterprise.

THE *Gas World* says that the gasholder which Messrs. Clayton, Son & Co., Limited, have been building for the South Metropolitan Gas Company at East Greenwich, London, is now complete and in full work, to the entire satisfaction of all parties concerned. The holder has a working capacity of over 12,000,000 cubic feet—the largest holder yet erected—has six lifts, the outer of which is 300 feet in diameter by 31 feet deep; and is placed in a concrete tank 34 feet deep, 21 feet of which is above the level of the surrounding ground. The tank was constructed by the Company's own workmen. The main novelty in the holder is that the two upper lifts rise above the outer guide framing, so that when fully inflated one-third of the holder is unguided externally.

## The Market for Gas Securities.

The market for city gas shares showed much animation during the week, the feature being Consolidated, which moved up sharply, sales having been made at 127¼ on Thursday. The opening bid price to-day (Friday) was 127¼, holders demanding 127⅜. Investors in this security have had a good year of it in 1892, the stock having opened in January last at 103½ bid, whereas the closing in December, 1892, is 24 points higher. Furthermore, the holder is now in receipt of 6 per cent. interest instead of 5 per cent. Holders of Equitable have fared even better, the net gain in the twelvemonth being 68 points—122 as against 190. Mutual holders also fared nicely, the advance being 22 points. These are very comforting figures to the holders of stocks in an industry which the electric lighting financiers are constantly asserting is going to seed.

Over in Brooklyn the quotations show a very similar state of affairs, all gas shares having scored substantial advances. There is in that city, however, considerable uncertainty over the situation, the consolidation rumors being such that no one can say where the "consolidaters are at." One pleasing development of the week in Brooklyn was a change in the executive management of the Equity Gas Company, President Devlin (peace be with him) having been superseded by Mr. B. J. H. Trask, and Mr. C. A. Kittle, formerly Manager of the East River Gas Light Company, was chosen Secretary. These are excellent appointments and ought to give investors confidence in the proceedings of the Company. Chicago gas has partly recovered the slump of a week ago, and will likely soon have recovered it all. Baltimore Consolidated is offered at 59.

## Gas Stocks.

**Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,**

16 Wall St., New York City.

January 2.

☞ All communications will receive particular attention. ☜
The following quotations are based on the par value of $100 per share.

| | Capital. | Par. | Bid | Asked |
|---|---|---|---|---|
| Consolidated | $35,430,000 | 100 | 127¼ | 127⅜ |
| Central | 500,000 | 50 | 90 | 95 |
| " Scrip | 220,000 | — | — | 100 |
| Equitable | 4,000,000 | 100 | 188 | 192 |
| " Bonds | 1,000,000 | — | 106 | 108 |
| Harlem, Bonds | 170,000 | — | — | — |
| Metropolitan, Bonds | 658,000 | — | 110 | 115 |
| Mutual | 3,500,000 | 100 | 142 | — |
| " Bonds | 1,500,000 | — | 100 | 102 |
| Municipal, Bonds | 750,000 | | — | — |
| Northern | | 50 | — | — |
| " Bonds | 150,000 | — | — | 100 |
| Standard Gas Co— | | | | |
| Common Stock | 5,000,000 | 100 | 35 | 40 |
| Preferred | 5,000,000 | 100 | 88 | 91x |
| Yonkers | | 50 | 112 | — |
| Richmond Co., S. I. | 346,000 | 50 | — | — |
| " Bonds | 20,000 | — | — | — |
| Gas Co's of Brooklyn. | | | | |
| Brooklyn | 2,000,000 | 25 | — | 142 |
| Citizens | 1,200,000 | 20 | 112 | 113 |
| " S. F. Bonds | 320,000 | 1000 | — | 103 |
| Equity Gas Light Co | 2,000,000 | 100 | 45 | — |
| Bonds | 1,000,000 | — | 70 | — |
| Fulton Municipal | 3,000,000 | 100 | 145 | 150 |
| " Bonds | 300,000 | | 102 | — |
| Peoples | 1,000,000 | 10 | — | 107 |
| " Bonds (7's) | 368,000 | — | 100 | — |
| " " (6's) | 94,000 | — | 100 | — |
| Metropolitan | 870,000 | 100 | 125 | — |
| " Bonds (5's) | 70,000 | — | 100 | — |
| Nassau | 1,000,000 | 25 | 160 | — |
| " Ctfs | 700,000 | 1000 | 99 | 100 |
| Williamsburgh | 1,000,000 | 50 | 145 | — |
| " Bonds | 1,000,000 | — | 107 | 110 |

Out of Town Gas Companies.

| | | | | |
|---|---|---|---|---|
| Boston United Gas Co.— | | | | |
| 1st Series S.F. Trust | 7,000,000 | 1000 | 88½ | 88¾ |
| 2d " " " | 3,000,000 | 1000 | 77½ | 78 |
| Bay State Gas Co.— | | | | |
| Stock | 5,000,000 | 50 | 56 | 57 |
| Income Bonds | 2,000,000 | 1000 | 77 | 78 |
| Buffalo Mutual, N. Y. | 750,000 | 100 | 110 | — |
| " Bonds | 200,000 | 1000 | 95 | 100 |
| Citizens, Newark | 1,000,000 | 50 | 155 | 160 |
| Chicago Gas Company. | 25,000,000 | 100 | 88⅜ | 88½ |
| Chicago Gas Light. & Coke Co.— | | | | |
| G't'd Gold Bonds | 7.650,000 | 1000 | 85 | 90½ |
| Equitable Gas & Fuel Co., Chicago, Bonds | 2,000,000 | 1000 | — | 101 |
| People's Gas and Coke Co., Chicago— | | | | |
| 1st Mortgage | 2,100,000 | 1000 | — | 108 |
| 2d " | 2,500,000 | 1000 | 104 | 105 |
| Consumers Gas Light Co., Jersey City | 2,000,000 | 100 | 20 | — |
| Bonds | 600,000 | 1000 | 80 | — |

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